

Applicant : Preston Whitcomb
Serial No. : 10/664,694
Filed : September 16, 2003
Page : 10 of 16

Attorney's Docket No.: 05689-017001

Amendments to the Drawings:

The attached replacement sheets of drawings includes changes to Figures 1B, 2A, 2B, 3, 5A, 6A, 6B, 7, 8, 9B, 9C, and 11and replaces the original sheets including Figures 1B, 2A, 2B, 3, 5A, 6A, 6B, 7, 8, 9B, 9C, and 11.

In Figures 1B, 2A, 2B, 3, 6A, 6B, 7, 8, 9B, 9C, and 11, Applicant amends the drawings to correct reference characters for consistency throughout and with the Specification.

In Figure 5A, Applicant deletes the descriptive text which is superfluous in view of the reference characters.

Attachments following last page of this Amendment:

Replacement Sheets (10 page)
Annotated Sheets Showing Change(s) (10 page)

REMARKS

Claims 1-42 are pending. Claims 1, 21, 23 and 29 are independent claims. Applicant amends claim 1, 21, 23 and 29 for clarity and proper antecedent basis and no new matter is entered thereby. Applicant has enclosed amended drawings to correct reference characters for consistency throughout and with the Specification. No new matter is entered thereby.

The Examiner identified the oath or declaration as defective because it does not identify the citizenship of each inventor. A new oath or declaration is submitted to comply with 37 C.F.R. § 1.67(a).

The Examiner objected to the abstract. Corrective amendments to the abstract are submitted to comply with M.P.E.P. § 608.01(b).

Rejections Under 35 U.S.C. § 102

The Examiner uses U.S. 6,024,393 (Shamlou) to reject claims 1-4, 7-12, 29-37 and 39-40 as having been anticipated.

Claim 1, as amended for clarification, recites an “end effector comprising a blade having a first end and a second end; the blade having an active area for sensing a distance between the end effector and the substrate.” Claim 29, as amended for clarification, recites “an active area for sensing a distance between the end effector and substrate located along the blade.” Both claims 1 and 29 recite “a passive gripper attached to the first end of the blade and an active gripper attached to the second end of the blade.”

Shamlou neither describes nor suggests an end effector including a blade having “an active area for sensing a distance between the end effector and the substrate” as recited in claims 1 and 29. In contrast, Shamlou discloses a capacitance sensor to indicate the presence of a substrate on the top surface of the handling blade, not the distance between the substrate and the end effector. See, for example, Shamlou at col. 12, lines 32-36.

Shamlou discloses a semiconductor substrate handling blade constructed from a “specialized material” which is non-metallic, preferably dielectric, exhibits the desired thermal stability and “must have also have a low-friction, non-abrasive surface which does not produce particulates when rubbed against the semiconductor device substrate construction to reduce particulate contamination.” Shamlou at col. 4, lines 26-49. A vacuum is applied through channels machined into the upper surface 203 of bottom plate 202 of the handling blade 100 terminating in vacuum openings 118 for holding a semiconductor substrate to the upper surface. See Shamlou, col. 8, lines 34-46.

The system recited in claim 1 and the method recited in claim 23 can be used, as described with particularity in the Specification, for handling substrates subject to bowing or warping which, in combination with other parameters, such as slot angle with respect to the horizontal alignment of the substrate within the cassette, increase the system requirements for handling the substrate. More specifically, “[t]he physical parameters of the substrate 24 and input cassette 34a, 34b are considered to determine the possible vertical zone occupied by the substrate 24 in the input cassette 34a, 34b.” Specification, p. 9, line 14-16.

The Specification also explains that “the total possible vertical space T_s that can be occupied by the substrate 24 is determined by summing the center point thickness of the substrate 24, the substrate thickness tolerance, the thickness variation the bow or warp amount, the pitch tolerance, the slot 70 angle with respect to the horizontal alignment (i.e., determinable movement of the substrate 24 within the slots 70 of the input cassette 34a, 34b due to the angle of the slots).” Specification, p. 9, line 24. Given the span of vertical space that the substrate can occupy due to bowing or warping, for example, for proper engagement, the blade senses the lowermost portion of the substrate before moving the end effector in position.

Further, the application of a vacuum from the handling blade of Shamlou is inapposite to handling a substrate subject to bowing or warping as described above and can result in permanent deformation and damage. Consequently, Shamlou teaches the away from the invention. “A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be

led in a direction divergent from the path that was taken by the applicant.” *In re Gurley*, 27 F.3d 551, 31 USPQ2d 1130 (Fed. Cir. 1994).

Accordingly, claim 1 is not anticipated by Shamlou. Claims 2-4 and 7-12 depend upon, and add further limitations to, claim 1. Accordingly, claims 2-4 and 7-12 are not anticipated by Shamlou. Claims 30-37 and 39-40 depend upon, and add further limitations to, claim 29. Accordingly, claims 30-37 and 39-40 are not anticipated by Shamlou.

The Examiner uses U.S. 6,618,645 (Bacchi) to reject claims 21-25 and 27-28 as having been anticipated.

Claim 21 recites “determining coordinate information of the substrates in the carrier; storing the coordinate information; sequentially indexing the robotic arm to the substrates in the carrier according the stored coordinate information; [and] measuring a distance to the substrate from the arm.”

Bacchi discloses a robotic arm end effector for transferring semiconductor wafers, the arm including sensors for determining positional data for the arm itself and the wafer to support “methods of rapidly and accurately placing and retrieving wafers from … the wafer cassette [and thereby to] … prevent accidental contact between the end effector and the wafers while effecting clean, secure gripping of the wafer. See Bacchi, Abstract.

Bacchi does not teach or suggest the quoted features of claim 21. While Bacchi does disclose “wafer edge and elevation sensors that provide accurate wafer 12 positioning data relative to the end effector 10” (Bacchi, col. 7, lines 11-18), there is no disclosure of determining coordinate information of the substrates in the carrier, storing the coordinate information, sequentially indexing the robotic arm to the substrates in the carrier according the stored coordinate information, and measuring a distance to the substrate from the arm as recited in claim 21. Specifically, Bacchi describes a light source fiber 84 and a light receiver fiber 86 “that form a narrow light transmission pathway for detecting the presence or absence of periphery 18 of wafer 12.” See Bacchi, col. 7, lines 18-35. Bacchi teaches detecting the presence, not the proximity, of the periphery of a wafer.

Moreover, and as described above and more fully in the Specification, the system includes an active sensor for sensing a distance between the end effector and the substrate. The physical characteristics of the substrate including, for example, subjectivity to bowing, warping and tilting, heighten the handling requirements of the substrate.

Bacchi fails to teach or disclose a passive gripper attached to the first end of the blade and an active gripper attached to the second end of the blade. Specifically, Bacchi does describe that “[t]he lack of moving mechanisms further causes end effector 10 to produce less contamination within cassette 14.” See Bacchi, col. 7, lines 1-3.

Claim 23, as amended for clarification, recites “providing a robotic arm including a mapping sensor and an end effector including a substrate sensor; moving the mapping sensor proximate to the cassette and recording the mean vertical substrate locations; generating a pick table including mean vertical substrate location data; sequentially indexing the robotic according to the mean vertical substrate locations of the pick table; engaging the cassette with the end effector; verifying the substrate position with the substrate sensor; and capturing and removing the substrate from the cassette with the robotic arm.”

As discussed above, Bacchi, neither describes nor suggests measuring proximity of the substrate held in a cassette to the end effector. In contrast, Bacchi discloses a “procedure by which end effector 100 accesses a predetermine wafer from among closely space apart wafers in a cassette” by moving the end effector such that “light transmission pathways 202 intersects the bottom surface chord 200 of any wafer in cassette 14 and additionally, detects any obstruction projecting from the cassette 14.” See Bacchi, col. 11, lines 24-28. Bacchi does describe other embodiments requiring the use of a “narrow light transmission pathway 244 for detecting the presence or absence of the periphery or bottom surface chord of a wafer.” The end effector of Bacchi senses objects “that interrupt the light transmission pathway 244.” See Bacchi, col. 23, lines 65 to col. 14, line 7.

As discussed above with respect to claim 1, the method for handling substrates of claim 23 can be used, in one application, in conjunction with substrates subject to bowing or warping which, in combination with other parameters such as slot angle with respect to the horizontal

alignment of the substrate within the cassette increase the handling requirements of the handling system while concomitantly maintaining acceptable throughput. Bacchi merely teaches the detection of the location of the peripheral edge 18 of the substrate 12, 12A but fails to teach or even suggest detecting coordinate information of the substrates in the carrier. Accordingly, claims 21 and 23 are not anticipated by Bacchi.

Claims 22, 24, 25, 27 and 28 depend upon, and add further limitations to claims 21 and 23. Accordingly, claims 22, 24, 25, 27 and 28 are not anticipated by Bacchi.

Rejections Under 35 U.S.C. § 103

The Examiner uses Shamlou to reject claims 5-6 and 41-42 as having been obvious. Claims 5-6 depend upon, and add further limitations to, claim 1 and claims 41-42 depend upon and add further limitations to, claim 29. For the at least reasons discussed above with respect to claims 1-4, 7-12, 29-40, Shamlou fails to render obvious claims 5-6 and 41-42.

The Examiner uses Shamlou and Bacchi to reject claims 13-16 as having been obvious. Claims 13-16 depend upon, and add further limitation to, claim 1. Bacchi fails to cure the deficiencies of Shamlou. For at least the reasons discussed above with respect to claim 1, claims 13-16 are not rendered obvious by Shamlou and Bacchi.

The Examiner uses Shamlou and U.S. 6,164,894 (Cheng) to reject claims 17-20 as having been obvious. Claims 17-20 depends upon, and add further limitations to, claim 1. Cheng fails to cure the deficiencies of Shamlou. For at least the reasons discussed with respect to claim 1, claims 17-20 are not rendered obvious by Shamlou and Cheng.

The Examiner uses Bacchi and Cheng to reject claim 26 as having been anticipated. It is believed that the Examiner intended to combine Bacchi and Cheng to reject claim 26 as having been obvious. Claim 26 depends upon, and adds further limitation to, claim 23. Cheng fails to cure the deficiencies of Bacchi. For at least the reasons discussed with respect to claim 23, claim 26 is not rendered obvious by Bacchi and Cheng.

Applicant : Preston Whitcomb
Serial No. : 10/664,694
Filed : September 16, 2003
Page : 16 of 16

Attorney's Docket No.: 05689-017001

The Examiner uses Shamlou and U.S. 6,040,585 (Hsiao) to reject claim 38 as having been obvious. Claim 38 depends upon, and adds further limitations to, claim 29. Hsiao fails to cure the deficiencies of Shamlou. For at least the reasons discussed with respect to claims 29, claim 38 is not rendered obvious by Shamlou and Hsiao.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicant asks that all claims be allowed. Please apply any other charges or credits to deposit account 06-1050, referencing the attorney docket number above.

Respectfully submitted,

Date: 6/13/2005

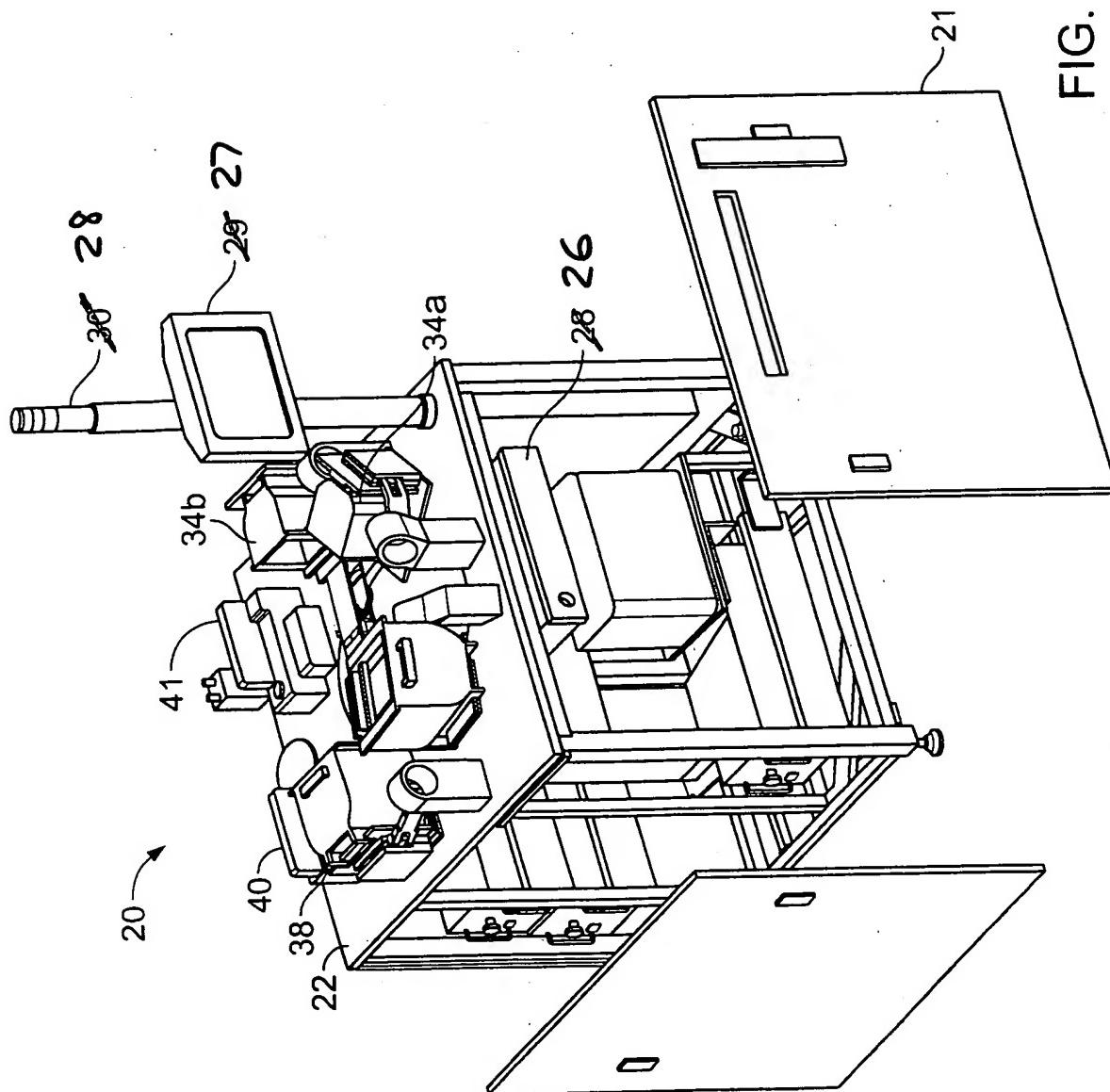


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FIG. 1B



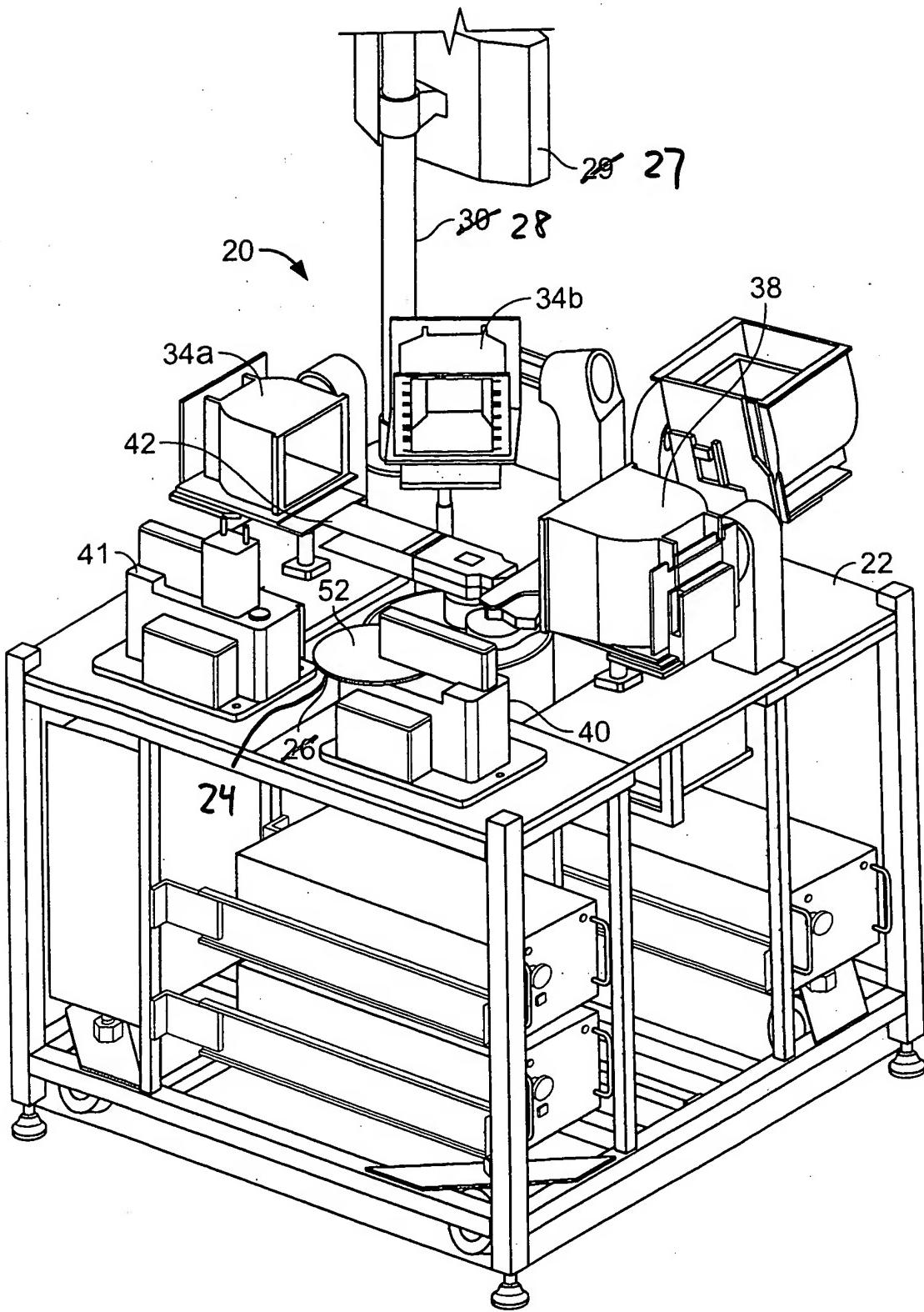


FIG. 2A

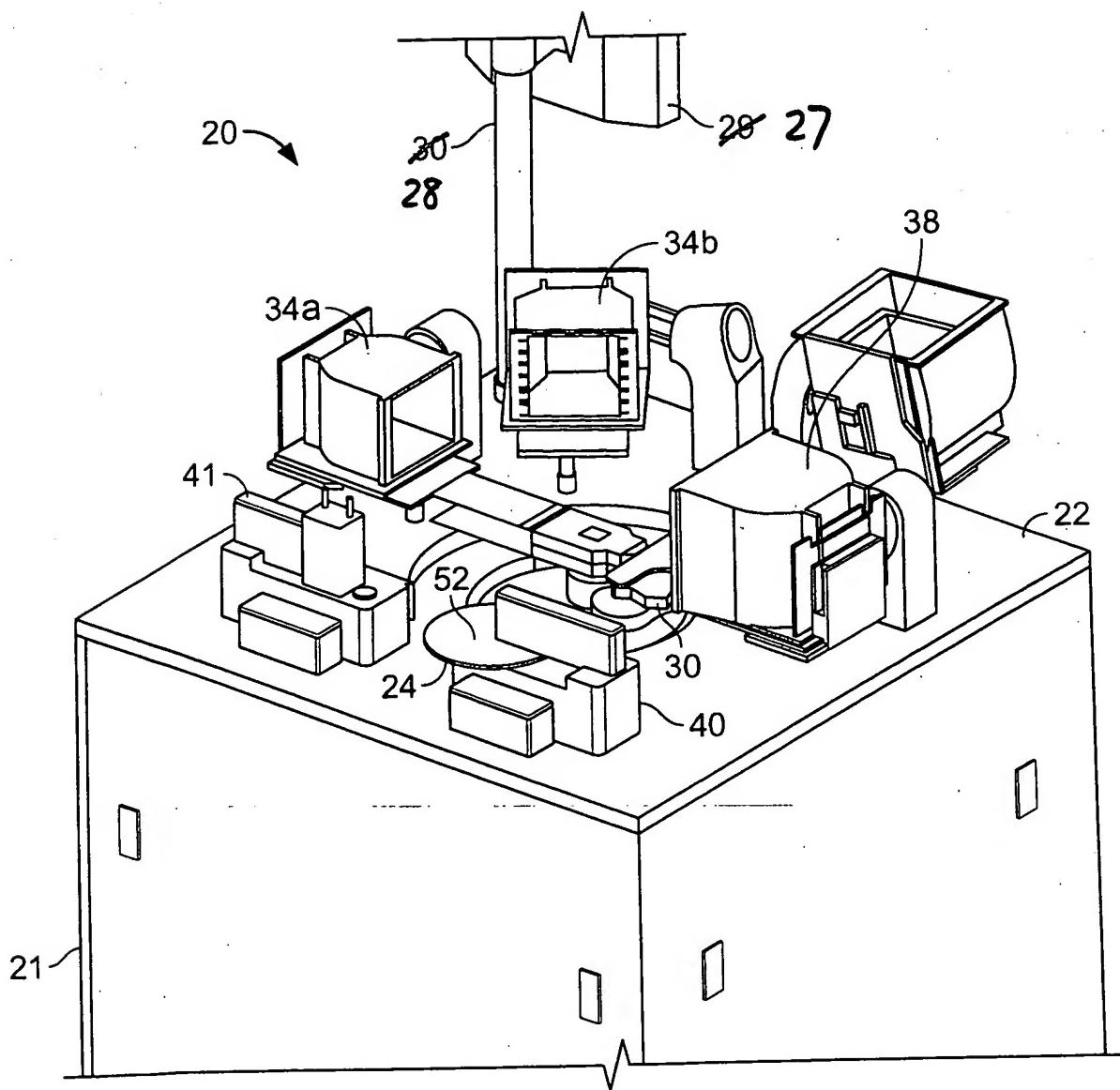


FIG. 2B

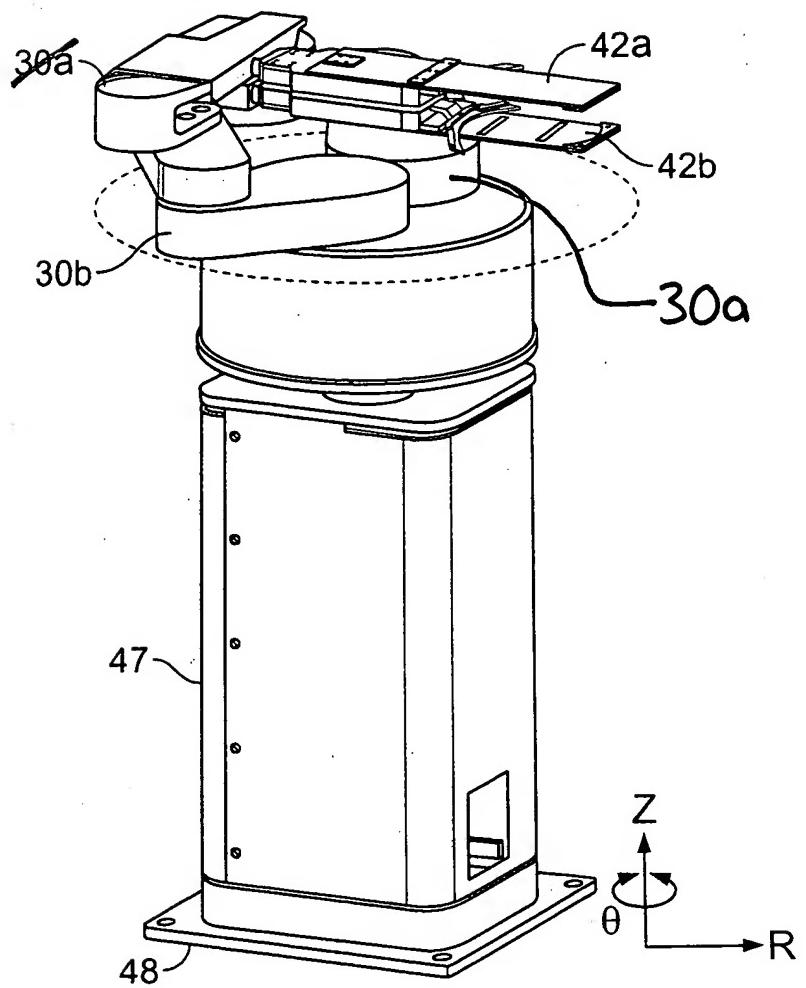


FIG. 3

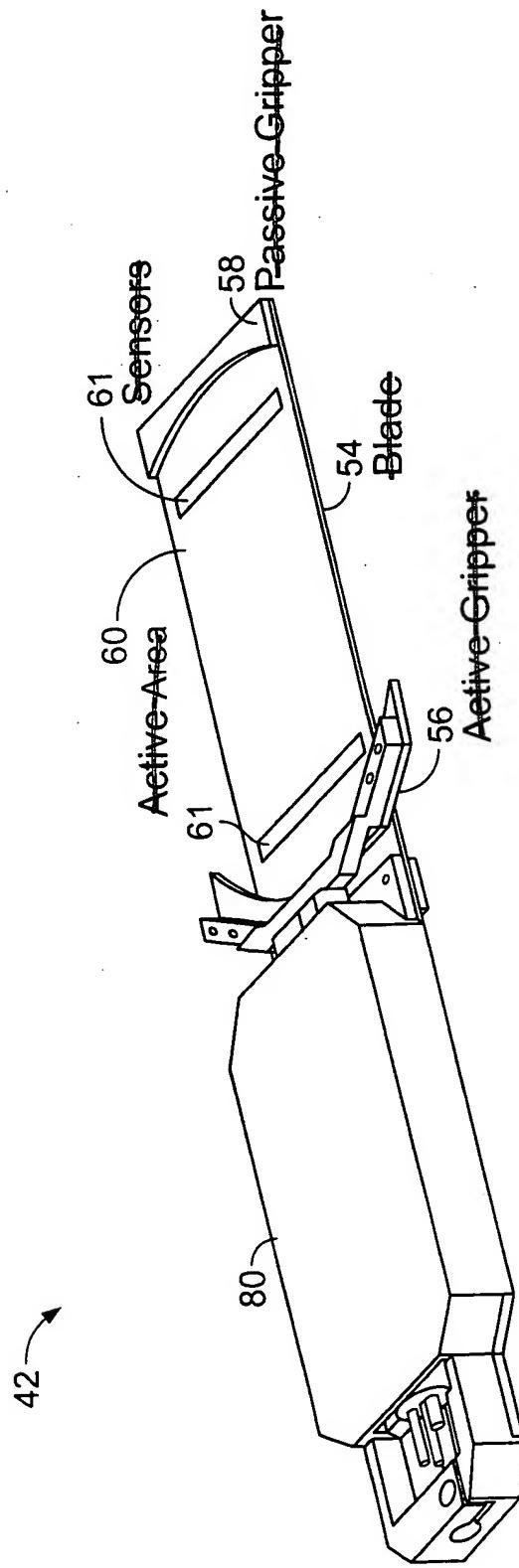


FIG. 5A

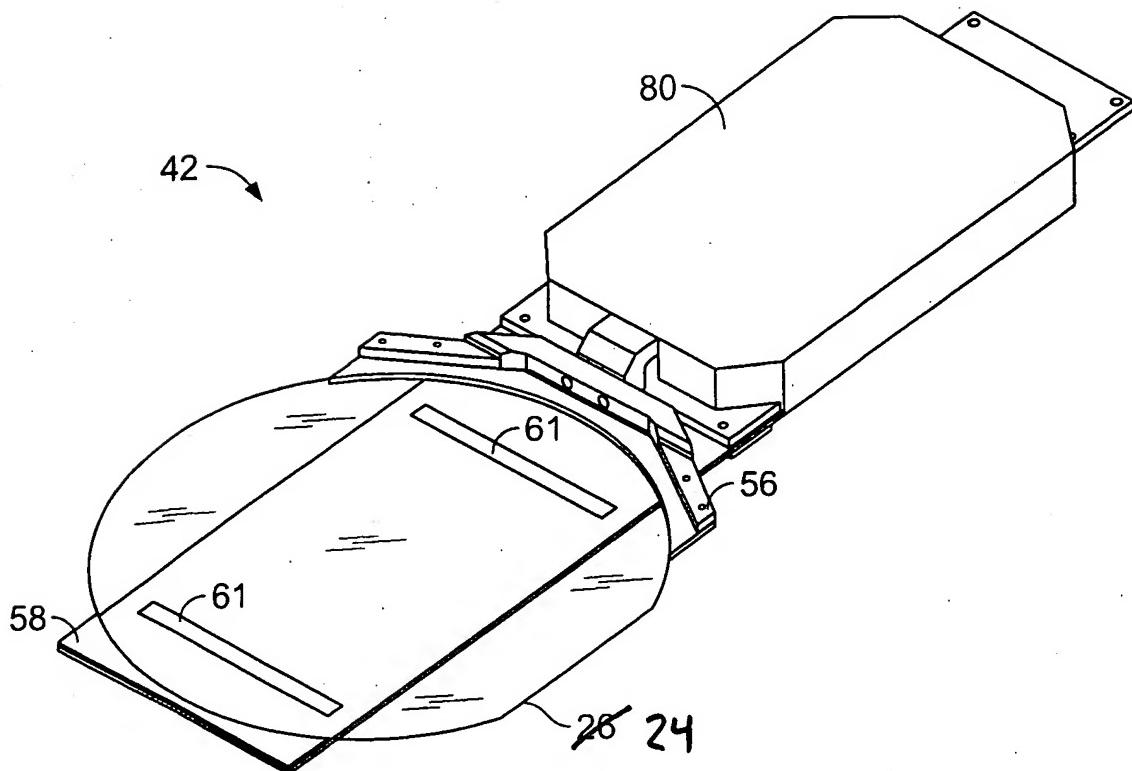


FIG. 6A

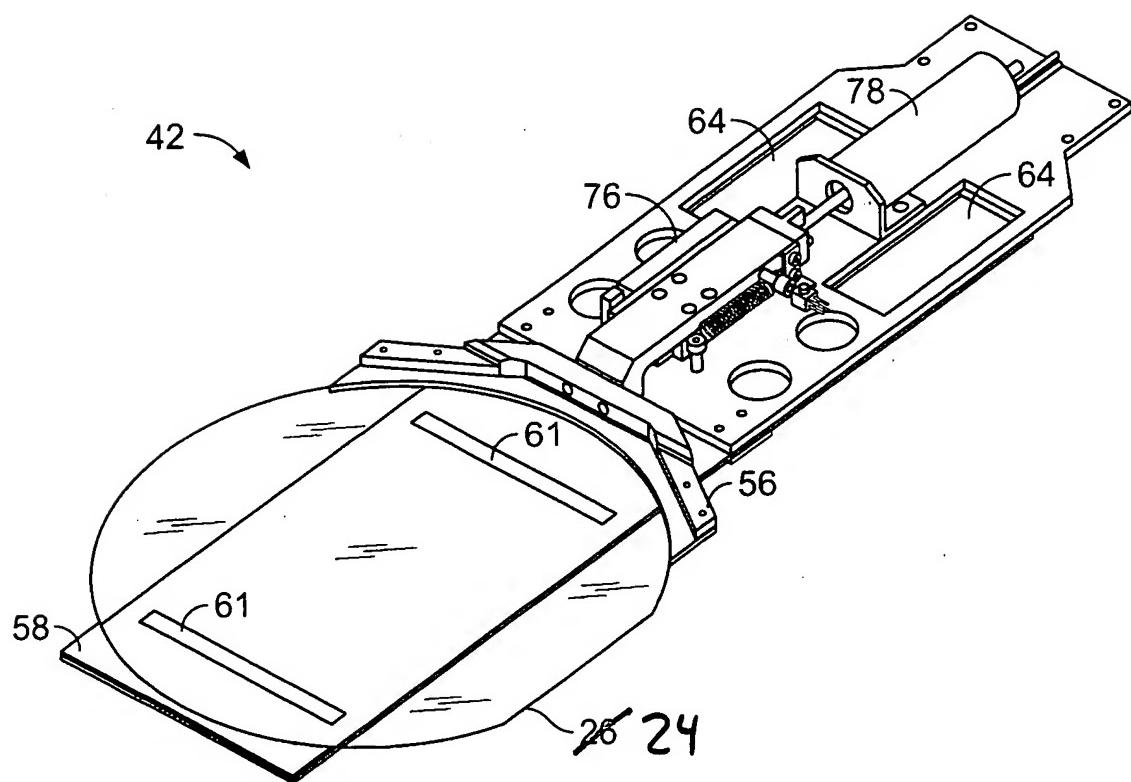


FIG. 6B

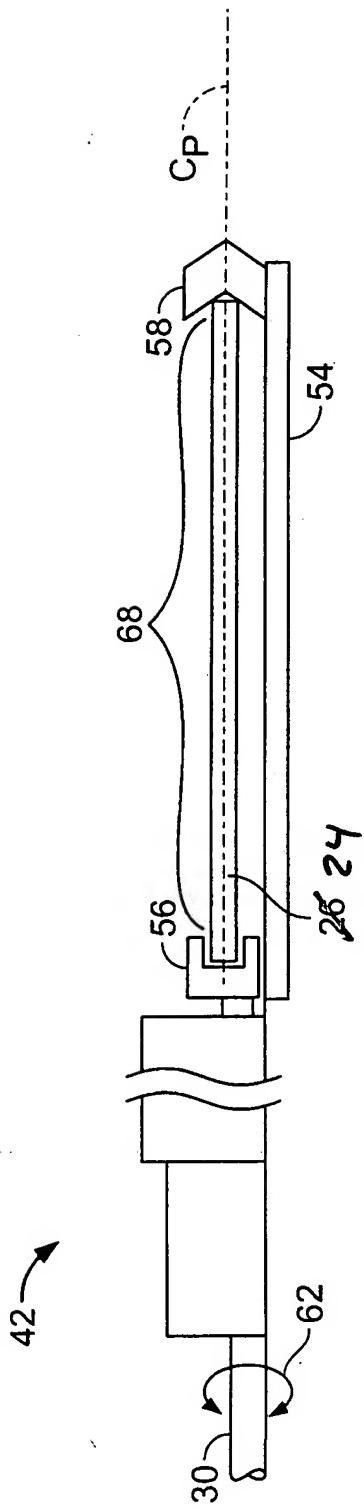


FIG. 7

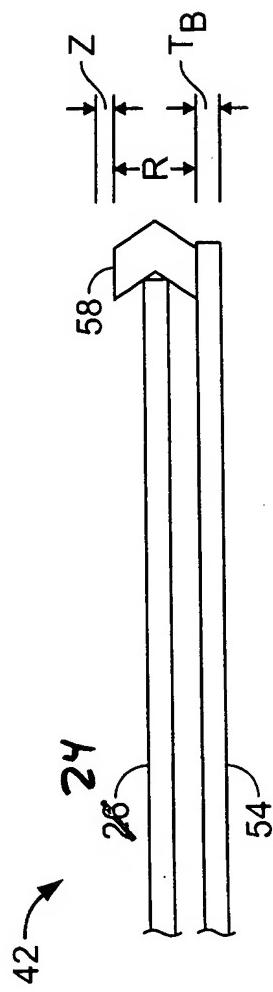


FIG. 8

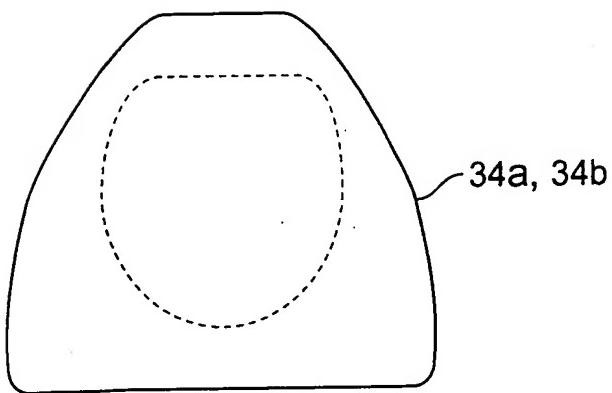


FIG. 9A

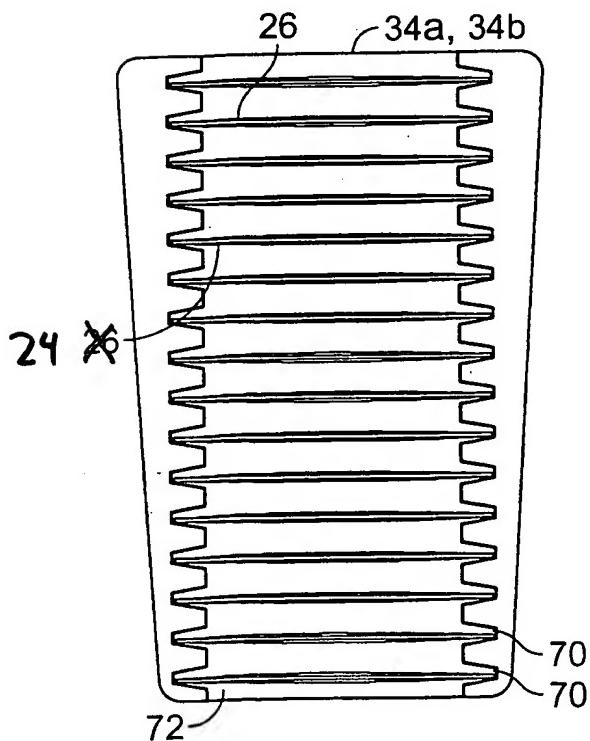


FIG. 9B

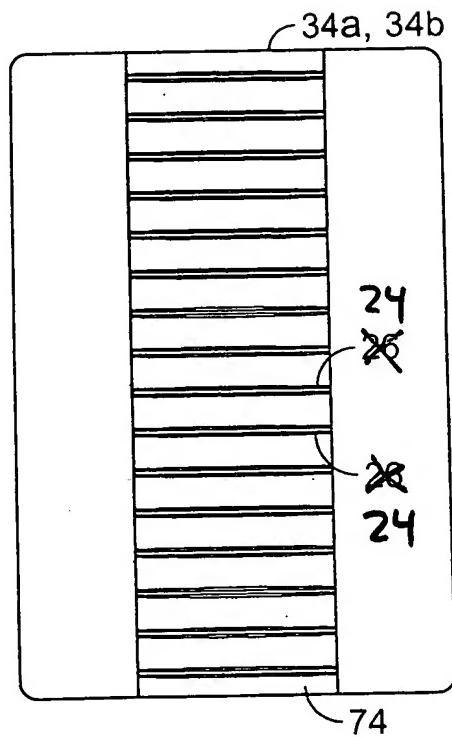


FIG. 9C

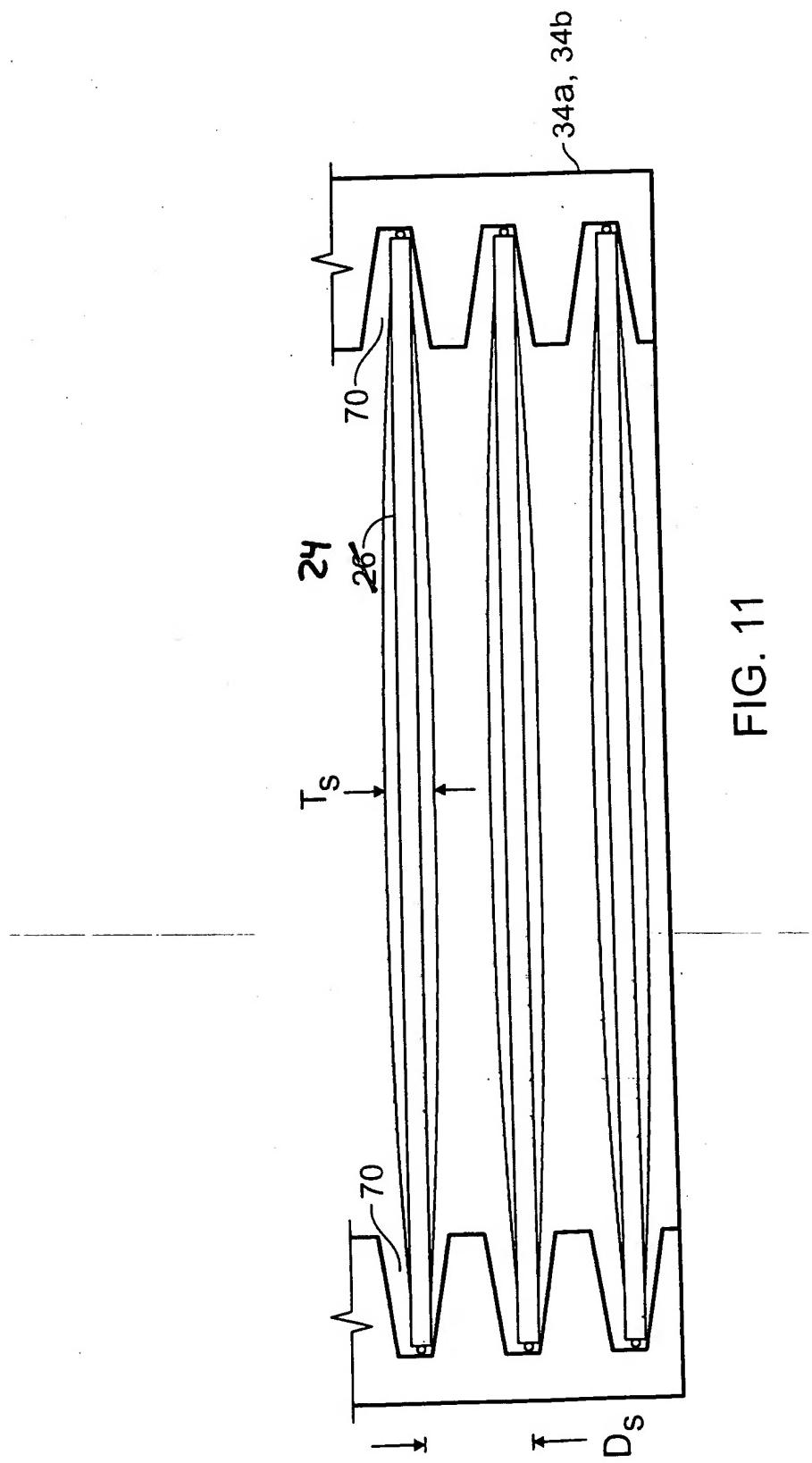


FIG. 11